

- (a) Show no loss of adhesion or separation between coats of the system when exposed to ultraviolet light and condensation of water.
- (b) The topcoat shall show no cracking more than is indicated by a rating of 6 (ASTM D 661).
- (c) The topcoat shall show no checking more than is indicated by a rating of 6 (ASTM D 660).
- (d) The CIELAB color difference ΔE , ΔL , Δa , and Δb units, shall not exceed 1.0 CIELAB units from the original color values measure before testing (ASTM D 2244).

3.18 Resistance to accelerated corrosion. When tested in accordance with 4.6.16, the coating system shall show no loss of adhesion, separation between layers of the system, or corrosion of the steel substrate beyond a 9 mm (3/8 in) radius from the centers of the impact areas.

3.19 Resistance to wear. When tested in accordance with 4.6.17, the percent weight loss on wear of the coating system shall not exceed 10 percent for type I, or 40 percent for types II, III and IV.

3.20 Adhesion of the intermediate coat (type III only). When tested in accordance with 4.6.18, the minimum adhesion strength of the intermediate coat shall be 400 lbs/sq-inch.

3.21 Storage stability.

3.21.1 Long-term storage stability. When tested in accordance with 4.6.19.1, the liquid one-part coating, or components of two-part coatings which have been stored for 1 year in their original containers at room temperature (75°F Average room temperature) shall, when mixed in accordance with the directions specified in 3.25, produce a coating system which meets all the requirements of this specification except 3.26. When tested in accordance with 4.6.5, the CIELAB color difference of the mixed non-skid topcoat and color topping shall not exceed 0.5 CIELAB units from the original color values measured prior to the shelf life test. The mixed non-skid topcoat and color topping shall also meet the requirements of 3.17.

3.21.2 Accelerated storage stability. When tested in accordance with 4.6.19.2, each individual coating of the non-skid coating system shall meet the requirements of 3.21.1. When tested in accordance with 4.6.5, the CIELAB color difference of the mixed non-skid topcoat and color topping shall not exceed 0.5 CIELAB units from the original color values measured prior to the shelf life test. The mixed non-skid topcoat and color topping shall also meet the requirements of 3.17 when the color difference is calculated using as the original color that is obtained for the one year storage test sample.

3.22 Thickness. When tested in accordance with 4.6.20, the average overall minimum thickness of the total, fully cured types I, II, and IV coating systems, including aggregate, shall be 0.75 mm (30 mils). Type III systems shall be a minimum of 2.25 mm (90 mils) which shall include a minimum of 1.5 mm (60 mils) of intermediate flexible underlayment.

3.23 Weight. When tested in accordance with 4.6.20, the mass of the cured coating system, including aggregate, shall not exceed the values in table VI.

TABLE VI. Maximum weight.

	Grams per centimeter squared (g/cm ²)	Pounds per square foot (lb/ft ²)
Type I	.484	.99
Types II & IV	.215	.44
Type III	.807	1.66

3.24 Materials (see 4.2.1).

3.24.1 Material safety data sheet. The contractor shall provide a completed material safety data sheet (MSDS) for each formula at the time of contract award. The MSDS form shall be in accordance with OSHA section 1910.1200, 29 CFR CH XVII and found as part of FED-STD-313. The MSDS shall also be included with each unit of issue of material covered by this specification (see 4.2.1 and 5.5).

3.24.2 Toxic materials. When evaluated in accordance with 4.7, the materials used in the components shall have no known carcinogenic or potentially carcinogenic materials identified by Occupational Safety and Health Administration (OSHA) regulated carcinogens, International Agency for Research on Cancer (IARC) latest monographs, and National Toxicology Program (NTP) latest annual report. The manufacturer is responsible for maintaining carcinogenic free materials. Questions pertinent to this requirement shall be referred by the contracting activity to the appropriate departmental medical service who will act as an advisor to the contracting activity. The contracting activity shall be provided with a copy of the Navy Environmental Health Center (NEHC) findings. The NEHC findings shall be included with each unit of issue of material covered by this specification (see 4.2.1 and 5.7).

In addition to the above toxicity restrictions, the toxicity characteristic content of the dried coating of the non-skid coating system shall not exceed the values listed in table VII when tested in accordance with 4.7.

TABLE VII. Toxicity characteristic.

Requirement	Maximum
Toxicity content (soluble), mg/L	
Arsenic	5.0
Barium	100.0
Benzene	0.5
Cadmium	1.0
Carbon tetrachloride	0.5
Chlordane	0.03
Chlorobenzene	100.0
Chloroform	6.0
Chromium	5.0
o-Cresol	200.0
m-Cresol	200.0
p-Cresol	200.0
2,4-D	10.0
1,4-Dichlorobenzene	7.50
1,2-Dichloroethane	0.50
1,1-Dichloroethylene	0.70
2,4-Dinitrotoluene	0.13
Endrin	0.02
Heptachlor (and its epoxide)	0.008
Hexachlorobutadiene	0.05
Hexachloroethane	3.0
Lead	5.0
Lindane	0.40
Mercury	0.20
Methoxychlor	10.0
Methyl ethyl ketone	200.0
Nitrobenzene	2.0
Pentachlorophenol	100.0
Pyridine	5.0
Selenium	1.0
Silver	5.0
Tetrachloroethylene	0.70
Toxaphene	0.50
Trichloroethylene	0.50
2,4,5-Trichlorophenol	400.0
2,4,6-Trichlorophenol	2.0
2,4,5,-TP (Silvex)	1.0
Vinyl Chloride	0.20

The values in table VII are instantaneous values for toxic materials and are not time weighted averages.

3.24.3 Toxicity certification. The manufacturer shall certify that each individual coating of the non-skid coating does not contain the following materials in excess of 0.06% by weight of the dry paint: toluene, chlorinated solvents that are not listed in table VII, hydrolyzable chlorine derivatives, and coal tar or coal tar derivatives.

3.24.4 Crystalline silica content. When evaluated in accordance with 4.7, each individual coating of the non-skid coating system shall not contain crystalline silica in excess of 0.1 % by weight of the dry paint.

3.24.5 Derivatives of ethylene glycol. When evaluated in accordance with 4.7, each individual coating of the non-skid coating system shall not contain esters or ethers of ethylene glycol.

3.24.6 Volatile organic content (VOC). When tested in accordance with 4.8, the individual VOC of the primer, intermediate coats and non-skid topcoats, when in the ready-to-apply condition, shall not exceed 340 g/L (2.8 lb/gal). When tested in accordance with 4.8, the VOC of the color topping, when in the ready-to-apply condition, shall not exceed 420 g/L (3.5 lb/gal).

3.24.7 Soluble metals content and total metal content. Soluble metals content and total metal content of each individual coating of the non-skid coating system shall not exceed the values listed in tables VIII and IX when tested in accordance with 4.9.

TABLE VIII. Soluble metals content.

Requirement	Maximum
Metals content (soluble), mg/L	
Antimony and/or its compounds	15
Arsenic and/or its compounds	5
Barium and/or its compounds (excluding barite)	100
Beryllium and/or its compounds	0.75
Cadmium and/or its compounds	1
Chromium (VI) compounds	5
Chromium and/or chromium (III) compounds	560
Cobalt and/or its compounds	80
Copper and/or its compounds	25
Fluoride salts	180
Lead and/or its compounds	5
Mercury and/or its compounds	0.2
Molybdenum and/or its compounds	350
Nickel and/or its compounds	20
Selenium and/or its compounds	1
Silver and/or its compounds	5
Thallium and/or its compounds	7
Vanadium and/or its compounds	24
Zinc and/or its compounds	250

TABLE IX. Total metals content.

Requirement	Maximum
Metals content (total), weight percent	
Antimony and/or its compounds	0.05
Arsenic and/or its compounds	0.05
Asbestos	0.0001
Barium and/or its compounds (excluding barite)	1.00
Beryllium and/or its compounds	0.0075
Cadmium and/or its compounds	0.01
Chromium (VI) compounds	0.05
Chromium and/or chromium (III) compounds	0.25
Cobalt and/or its compounds	0.80
Copper and/or its compounds	0.25
Fluoride salts	1.80
Lead and/or its compounds	0.06
Mercury and/or its compounds	0.002
Molybdenum and/or its compounds	0.35
Nickel and/or its compounds	0.20
Selenium and/or its compounds	0.01
Silver and/or its compounds	0.05
Thallium and/or its compounds	0.07
Vanadium and/or its compounds	0.24
Zinc and/or its compounds	0.50

3.25 Directions for mixing and applying. The manufacturer shall provide written directions for mixing and applying each individual coating used in the non-skid coating system on its container. These directions shall cover both small (1 L or 4 L) (1 quart [qt] or 1 gal) and field (19 L) (5 gal) kit procedures, and shall specifically state the differences, if any, between the two. These directions shall be in the format specified in ASTM F 718 and shall include, as a minimum, information on the mixing ratios by mass and by volume, induction time, pot life, upper and lower temperature and humidity limits for application, coverage per L (gal), and safety precautions (see 4.2.1).

3.26 Performance in service. When tested in accordance with 4.11, the coating system shall show none of the following:

- (a) wear-through (profile of the non-skid surface reduced to showing the primer or steel deck);
- (b) ASTM D 660 checking (slight breaks in the film not penetrating to the underlying surface rated less than ASTM 8;
- (c) ASTM D 661 cracking (breaks which extend through the coating film to the substrate surface) rated less than No 8;
- (d) breaking (flaking);
- (e) loss of adhesion (peeling);
- (f) or other deficiency which would adversely affect its performance as specified in table X.

TABLE X. Service life values.

	Composition G (months)	Composition L (landings)
Type I	12	10,000
Type II	6	5,000
Types III and IV	6	-----

3.27 Label. Manufacturer shall prepare container label instructions for each individual coating used in the non-skid coating system on its container in accordance with the requirements of 29 CFR Parts 1910, 1915, 1917, 1918, 1926 and 1928 - Hazard Communication Act, Final Rule (see 5.1).

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of the manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- (a) Qualification inspection (see 4.3).
- (b) Quality conformance inspection (see 4.4).

4.2.1 Certification data/report. When specified in the contract or order, each lot of each individual coating material shall be certified (see 6.3).

4.3 Qualification inspection. Qualification inspection shall be conducted at a Government, commercial or manufacturer's laboratory approved by the Naval Sea Systems Command (NAVSEA). Tests specified in 4.6.9 (Fire Resistance), 4.7 (Toxicity), and 4.11 (Performance in service) shall be performed by the Government. Tests at other than a Government laboratory shall be monitored by the

Defense Contract Management Area Operations (DCMAO). Qualification tests shall consist of the tests specified in 4.6, 4.7, 4.8, and 4.9. The service test shall be conducted on a flight deck as specified in 4.11 after successful completion of all laboratory tests in 4.6, 4.7, 4.8 and 4.9 with the exception of 4.6.18 and 4.6.19.1 which shall be performed concurrently. Testing of products on Government ships shall be conducted at the convenience of the Government.

4.3.1 Qualification samples. For qualification testing specified in 4.11, a sample of each individual coating of the non-skid coating system being qualified to a specific type and composition shall be submitted to the NAVSEA approved laboratory sufficient to cover 186 m² (2000 ft²). One L (1 qt) samples of all resin in the system and non-skid aggregate shall also be submitted to the NAVSEA approved laboratory for qualification testing. Each individual coating of the non-skid coating system tested shall be drawn from regular production stocks by a government representative. A test report detailing the results of any required testing performed by the manufacturer, his representatives or at his behest by employed agents shall be provided by the manufacturer to the contracting officer, his agent or the qualifying activity, as appropriate.

4.3.1.1 Manufacturer's shall qualify total non-skid systems consisting of:

- (a) Type I, compositions G and L: The total non-skid coating system shall consist of an optional primer (if the non-skid topcoat is designed for direct application to the substrate), any needed intermediate coatings, non-skid topcoat, and color topping coatings.
- (b) Type II, compositions G and L: The total non-skid coating system shall consist of a primer, any needed intermediate coatings, non-skid topcoat, and color topping coatings.
- (c) Type III, composition G: The total non-skid coating system shall consist of a primer, any needed intermediate coatings, non-skid topcoat, and color topping coatings. (Note: type III does not include a composition L).
- (d) Type IV, composition G: The total non-skid coating system shall consist of a primer, any needed intermediate coatings, non-skid topcoat, and color topping coatings. (Note: type IV does not include a composition L).

4.3.2 Extension of qualification. Approval of qualification for Navy dark gray to match color 36076 of FED-STD-595 shall constitute approval for other colors of the same type and composition. Systems that are submitted for qualification for type I that do not pass the durability requirements for type I but pass the durability requirements for type II shall be qualified for type II of the same composition-provided that the system passes all other requirements for that type and composition. Approval of qualification for type III does not constitute approval for type I and II.

4.3.3 Retention of qualification.

4.3.3.1 Cancellation of qualification. A manufacturer's qualified product list (QPL) approval is subject to immediate cancellation for any of the following:

- (a) Failure of any individual coating of the non-skid coating system to meet any of the requirements of section 3 when tested in accordance with section 4.2.
- (b) Manufacturer changes in any individual coating composition, or changes to ASTM F-718 data sheets, which were submitted with the application for approval, without prior NAVSEA approval.

4.4 Quality conformance inspection.

4.4.1 Lot. For purposes of sampling, inspection, and testing, a lot shall consist of containers from one uniform batch of coating material produced in one facility using the same raw materials and production processes and offered for delivery at one time. A batch is defined as the end product of a single manufacturing process which begins with several raw materials and includes one or more constituent operations. Any change to a batch shall constitute a new lot. The size of the lot shall be measured in units of 3.785 L (1 gal).

4.4.1.1 Sampling for quality conformance inspections and tests. As a minimum, the contractor shall randomly select a sample quantity from each lot of coating material in accordance with table XI and subject them to the inspection and tests of 4.4.2, 4.4.3, 4.6, 4.7, 4.8, 4.9, and 4.11. The sample size depends on the lot size. If one or more samples fail an inspection lot test, the entire lot shall be rejected. The contractor has the option of screening 100% of the rejected lot for the defective characteristic(s) or providing a new lot, which shall be tested in accordance with the sampling plan herein. The contractor shall maintain for a period of three years after contract completion, records of inspections, tests, and any resulting rejections.

TABLE XI. Sample size for quality conformance inspections and tests.

Lot size	Sample size
2 - 25	3
26 - 50	5
51 - 90	6
91 - 150	7
151 - 280	10
281 - 500	11
501 - 1200	15
1201 - 3200	18
3201 - 10,000	22
10,000 and over	29

4.4.2 Inspection of packaging. An inspection shall be made to determine that the packaging (preservation, packing, marking, and labeling) for shipment, stowage and storage shall comply with the requirements of section 5 and the documents specified therein.

4.4.3 Lot acceptance tests. Each lot of the individual coatings of the non-skid coating system offered for delivery shall be subjected to the tests specified in table XII.

TABLE XII. Lot acceptance tests.

Characteristics	Requirement paragraph	Test paragraph
Abrasion of arresting cable <u>1/</u>	3.3	4.6.1
Appearance of dried coating	3.4	4.6.2
Application properties	3.5	4.6.3
Coefficient of friction <u>1/</u>	3.6	4.6.4
Color	3.7	4.6.5
Condition in Container	3.8	4.6.6
Drying time	3.10	4.6.8
Flash point	3.12	4.6.10
Flexibility <u>1/</u>	3.13	4.6.11
Impact resistance <u>2/</u>	3.15	4.6.13
Pot life	3.16	4.6.14
Resistance to wear <u>1/</u>	3.19	4.6.17
Thickness <u>1/</u>	3.22	4.6.20
Weight <u>1/</u>	3.23	4.6.20

1/ Needs only to be performed on first lot and every 19,000 L (5000 gal) thereafter.

2/ Perform this test on duplicate panels cured 4 days at room temperature (75°F) for each batch delivered using only 4.6.13(a) (the seawater immersion testing condition can be omitted for lot acceptance testing). For each 5000 gal of material delivered, the entire test (4.6.13(a) and 4.6.13(b)) shall be performed on the first lot delivered.

4.5 Preparation for testing.

4.5.1 Standard conditions. In case of dispute, tests shall be performed at standard testing conditions, which are 24 plus or minus (+/-) 2°C (75°F +/- 5°F) and a relative humidity of 50% +/- 5 %, with the exception of 4.6.3 which shall be performed at the temperatures specified.

4.5.2 Panel substrate material. Steel panels in accordance with 4.5.2.1 shall be used for all of the tests specified in 4.6 which require test panels. In addition, reinforced plastic, teak and douglas fir panels in accordance with 4.5.2.2 and 4.5.2.3 shall also be used for the tests specified in 4.6.12 and 4.6.13.

4.5.2.1 Steel surfaces. Ordinary strength steel panels 3 mm (1/8 in) thick (nominal) in accordance with grade A of MIL-S-22698 shall be abrasive-blasted to a uniform white-metal finish in accordance with SSPC SP5 to a 51 to 102 micrometers (3 to 4.5 mil) profile. This finish is characterized by the removal of all foreign matter, the absence of visible residues and discolorations, a gray-white uniform color, and a uniform slightly roughened surface. The panels shall then be cleaned with oil-free air or vacuum, and protected from moisture during storage.

4.5.2.2 Reinforced plastic surface. Fiberglass surface coating shall be applied to an "A" face of AC plywood, and shall consist of two layers of chopped strand mat, 1.5 oz/sq-ft, Owens-Corning M-721 or equal and one surface layer of 10.5 oz/sq-yd woven cloth, style 7500, with amine-silane treatment. Fiberglass reinforcement shall be applied in three sequential layers each well saturated and rolled or squeezed free of air bubbles, with a resin system of Reichhold Chemicals 37-127 epoxy and 37-607 hardener at a ratio of 100 to 45 parts by weight respectively. Final resin coat shall cover the glass fiber by 10-20 mils. The glass fiber shall meet the requirements of MIL-C-9084, type XII or type XIIA, class 2. The covering shall be allowed to cure seven days minimum. Sanding and coating humidity conditions shall be same as 4.5.2.3.

4.5.2.3 Wood species. Wood species will be used for type III testing only. Panels shall be conditioned to equilibrium moisture content (EMC) of 15 +/- 2% (Coating shall be applied at the same relative humidity (RH) and temperature required to provide a constant EMC). The surface shall be sanded smooth with grit no coarser than 120 aluminum oxide.

4.5.2.3.1 Teak. Teak species shall be Tectona grandis of asian origin; surface shall be clear wood, no defects.

4.5.2.3.2 Douglas Fir. Douglas fir shall be species of Pseudotsuga menziesii.

4.5.3 Preparation of test panels. Panels prepared as specified in 4.5.2 shall be primed with the primer, if any, designated by the contractor (see 3.2 and 3.5). The primer film thickness on test panels shall be within a tolerance of +/-0.025 mm (1 mil) of the contractors recommended thickness. If a range is given for the primer thickness, the minimum number shall be used for testing purposes except for those tests in section 4.6.12 and 4.6.13 where the maximum number shall be used. The primer shall be allowed to dry for the time specified by the contractor (see 3.25). The intermediate coats, if any, and topcoat shall be mixed, kept at standard conditions during the induction time, if any, applied, as specified in the contractor's instructions (see 3.25), and allowed to cure for 14 days at standard conditions unless otherwise specified in the test method.

4.6 Tests. Tests shall be conducted in accordance with the procedures specified herein. Each result shall be compared with the applicable requirement in section 3, and evaluated for conformance.

4.6.1 Abrasion of arresting cable (composition L only). Three 250 by 150 by 3 mm (10 by 6 by 1/8 in) (nominal) test panels shall be prepared as specified in 4.5.3. Each panel shall be conditioned by running 50 cycles in the cable abrasion tester specified herein before determination of the abrasion of the arresting cable. Each panel shall be used to abrade a new 3 mm (1/8 in) (nominal) diameter, 300 mm (12 in) (nominal) long cold-rolled ASTM A 229 Class 2 steel rod. The diameter of each rod shall be measured before use to the nearest 0.0025 mm (0.1 mil) in ten places which will come in contact with the test panel. The rod shall be held in a jig in the test apparatus as shown on figure 1. After completion of 200 cycles in the abrasion machine, the rod shall be removed from the jig and the diameter of the rod shall be measured to the nearest 0.0025 mm (0.1 mil) in the